

## REMARKS/ARGUMENTS

Claims 9-21 and new claims 22-26 are pending in the present application for the Examiner's review and consideration. With respect to the restriction, claims 1-8 had been withdrawn by Examiner teleconference and claims 9-21 were elected in the same teleconference. Claims 1-8 have been cancelled by this amendment, without prejudice. Claims 12 and 19 have been rejected under 35 USC 112. Claims 9-16 have been rejected under 35 USC 102(a) and claims 17-21 stand rejected under 35 USC 103(a). Claims 12, 19, and 20 have been amended by this document. The specification has been amended by this document. No new matter has been added.

New claims 22-24 recite aspects of methods of forming an organic photovoltaic device (See, e.g., Specification, ¶ [0047]), while claims 25-26 recite alternate aspects of methods of forming an organic photovoltaic device (See, e.g., Specification, ¶ [0039] – [0043]). No new matter has been added by way of this amendment, such that their entry at this time is warranted.

### I. Priority

The office action noted that the priority data provided was not consistent with the Patent and Trademark Office records. The above referenced pending application was filed with a priority claim referencing a provisional patent application, but this reference included a typographic error in the serial number of such reference: the incorrect reference was to U.S. Provisional Patent Application Ser. No. 60/428,108, wherein the underscored 8 should have been a 6. On June 19, 2007, the Applicant submitted a Petition for the Acceptance of Unintentionally Delayed Claim for Priority Under 37 CFR 1.78(a) to claim priority to the correct provisional patent application. A copy of the petition and provisional patent application are included in Appendix A for the Examiner's convenience.

Thus, the Applicant intended to claim priority to U.S. Provisional Patent Application Ser. No. 60/426,108. Subject to the Commissioner's acceptance of the petition, the Applicant has amended the specification with such correction.

## **II. The 35 USC 112 Rejections**

Claim 12 was rejected for being indefinite under 35 USC 112 for use of the term “easily.” Claim 12 has been amended to delete the words “easily dried,” and to insert the definite limitation of “removed by drying.”

Claim 19 was rejected for being indefinite under 35 USC 112 for use of the terms “enhancing” and “photovoltaic block copolymer film.”

The office action cited the term “enhancing” of the original claim 19 as failing to provide a standard of degree. Claims 19 and 20 have been amended to delete the word “enhancing.” The carrier collection materials are described within the specification ¶ [0050] and within the incorporated reference, C. Brabec, et al., *Organic Photovoltaics: Concepts and Realization,* Springer, Berlin (2003).

The office action cited the term “photovoltaic block copolymer film” of the original claim 19 as unclear. Claim 19 has been amended to delete the word “film,” so that claim 19 references claim 18 using the same terminology as provided within claim 18.

With these amendments, the applicant respectfully requests that these rejections under 35 USC 112 be reconsidered and withdrawn.

## **III. The 35 USC 102(a) Rejection**

### **Claims 9-16**

The office action rejected claims 9-16 under 35 USC. 102(a) as being anticipated by Fan, et al., (“Synthesis and Characterization of a Novel block Copolymer,” *Proceedings of Polymeric Materials: Science Engineering*, v.86, 47, 2002). The Applicant respectfully encloses herewith in Appendix B the Declaration of Sam-Shajing Sun under 37 C.F.R. 1.131 stating that he is the sole inventor of the present application and is a co-author of Fan, et al. The other co-authors of Fan, et al. were merely working under his direction within the Center for Materials Research at Norfolk State University. Thus, the inventor’s conception preceded publication.

U.S. App. Ser. No. 60/426,108 was filed on November 14, 2002, in the same year as publication of Fan, et al. The present application, U.S. App. Ser. No. 10/714,230 (as amended), in conjunction with a Petition for the Acceptance of Unintentionally Delayed Claim for Priority Under 37 CFR 1.78(a) filed June 19, 2007, claims priority to that provisional patent application.

Thus, Fan, et al., is not prior art against the claims of the present application and the rejection of these claims should be withdrawn.

#### **IV. The 35 USC 103(a) Rejection**

##### **Claim 17**

Claim 17 was rejected under 35 USC 103(a) as being unpatentable over Fan et al. in view of US5041510 to Allen et al., and Visscher, et al. As shown in III above, the Declaration of Sam-Shajing Sun Under 37 C.F.R. 1.131 demonstrates that Fan, et al., is not prior art against the present application and the rejection of claim 17 should be withdrawn.

#### **V. The 35 USC 103(a) Rejection**

##### **Claims 18 – 21**

Claims 18-21 were rejected under 35 USC 103(a) as being unpatentable over Brabec, et al., (“Origin of the Open Circuit Voltage of Plastic Solar Cells,” Advanced Functional Materials, Vol. 11, Issue 5, pages 374-380 (2001), in view of various other citations for the above referenced claims. The Applicant respectfully submits that, among other limitations, Brabec and the associated citations fail to disclose the limitation of a block copolymer.

Brabec, et al., discloses a donor type of conjugated polymer (e.g., MDMO-PPV) that is physically blended or mixed with four different acceptor types of fullerene derivative molecules (Azafulleroid 5, ketolactam 6, PCBM, and C60) each. See Brabec, pp. 374-375 (¶ 1). The solar cell devices were “produced by doctor blading the active layer donor-acceptor composite from toluene solutions...” Brabec, p. 376 (¶ 2.3.1)(emphasis supplied).

The solar cells made from these four different donor/acceptor blends were then studied. Brabec’s main observation or conclusion was that open current voltage of the studied blends was

directly correlated to the LUMO of the acceptor fullerene, instead of the work function of the metal electrode. See Brabec, p. 379 (¶ 3) Brabec refers to the mixture as “this type of donor-acceptor bulk-heterojunction cell.” Id.

Similarly, the citations of Sethuramen, et al., Nava, et al., and Hummelen, et al., do not disclose the use of photovoltaic block copolymers. Sethuramen, et al. is directed to cleaning particles from a semiconductor topography that was polished with a fixed-abrasive polishing process. Any photovoltaic polymers disclosed within the citations relate to structures other than block copolymers. The publication to Nava, et al., discloses “interpenetrating blends of donors and acceptors” having “heterojunctions.” See Nava, et al., p. 1586, The publication of Hummelen, et al. discloses a donor type of polymer that is physically mixed with an acceptor type of molecules (e.g., PCBM) to form a “blend” having “heterojunctions,” (i.e., like that in Brabec, et al.), and solar cells fabricated from such blend materials. See Hummelen, et al., pp. 76-77.

In contrast, the present application relates to block copolymers, including methods and devices for their use. A “photovoltaic block copolymer” is a polymer whose main chain or backbone is composed of different or distinct segments or blocks, each block having a unique monomer repeat unit and chemical structure, and the different blocks are connected via covalent chemical bonding. See Specification ¶¶ [0022] – [0023]. A donor type of conjugated polymer **D** may be chemically or covalently connected with an acceptor type of conjugated polymer (**A**) via non conjugated bridge chains to form a D-B-A, or D-A-B type block polymers. Id. This mechanism of connecting block copolymers differs from the relationship of the donor and acceptor components within a blended mixture or composite.

Aside from the missing limitation of block copolymers, citations such as Brabec, et al., Hummelen, et al., etc. teach away from the present invention. The phase separation of different blocks in block copolymers are controlled or constrained at the molecular or block segment level; this aspect yields a different category of nano-structures. In contrast, the phase separation of different polymers in a blend or composite mixture is random and uncontrollable. A blend or mixture would necessarily not require the steps of connecting copolymers that are disclosed and claimed in claims 18-25. Conversely, a blend or mixture would remove the controlled or constrained aspects of the block copolymers of the present invention. See, e.g., Specification ¶ [0039].

## V. Conclusion

The applicant respectfully submits that all claims, namely claims 12 and 19 have been amended to point out and distinctly claim the invention, and that claims 9-26 are patentably distinguishable over the art applied. Accordingly, applicant respectfully requests that a Notice of Allowance be issued in this case. Should the Examiner not agree, then a telephone interview is respectfully requested to discuss and to resolve any remaining issues in allowance of this application.

Respectfully submitted,



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**Attachment A**